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(58) Field of Search
UK CL (Edition O) G2J JRB1 JRB2 J17D J31D4
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(54) Telescope mounting

(57) A mounting for a telescope comprises a base 10, a first member 16 mounted on the base for rotation about a first axis and a second member 26 mounted on the first member for rotation about a second axis which is inclined at an angle to the first axis. A telescope 36 is mounted to pass centrally through the second member, the longitudinal axis of the telescope being inclined at an angle to the second axis. Thus the telescope can be positioned at any compound angle within approximately a hemisphere, depending on the angles selected, by a combined rotation of the first and second members. In use for astronomical purposes, each of the angles may be approximately 45°.

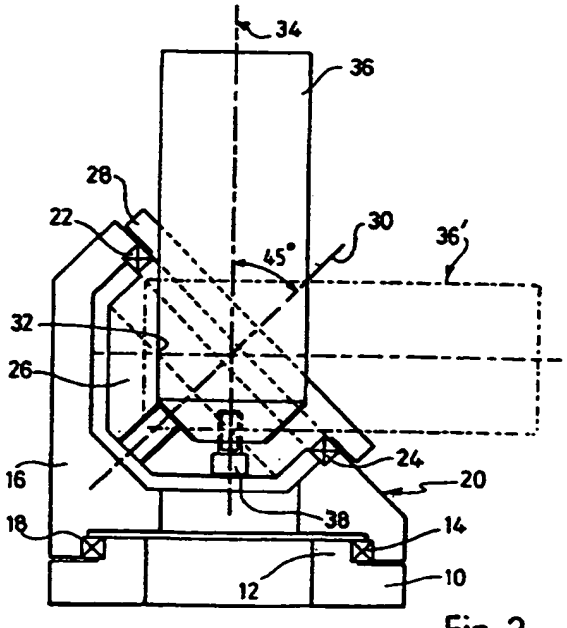

Fig. 2

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1995

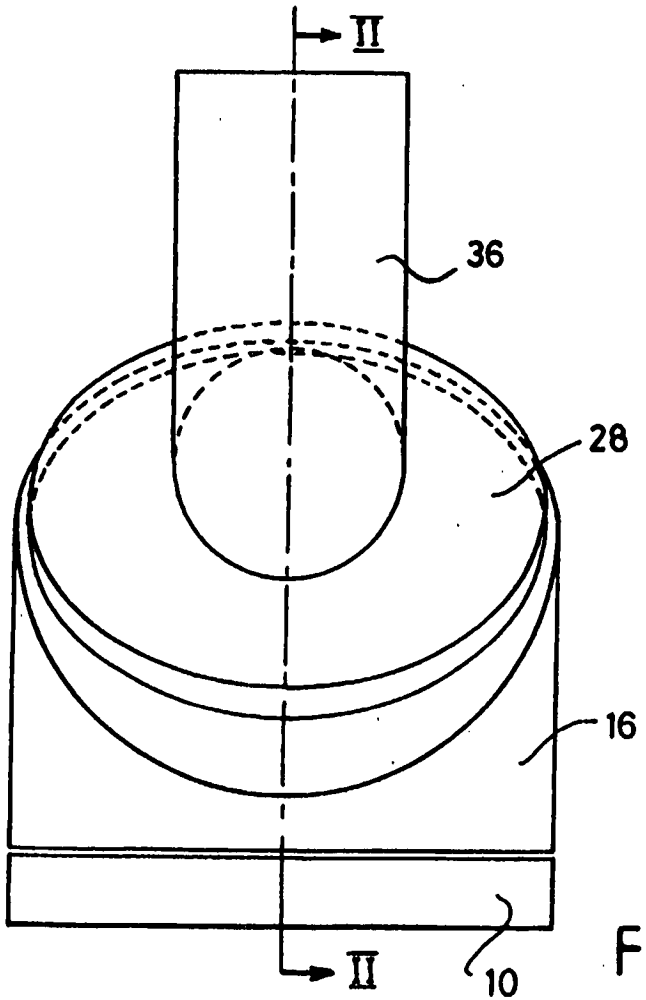

Fig. 1

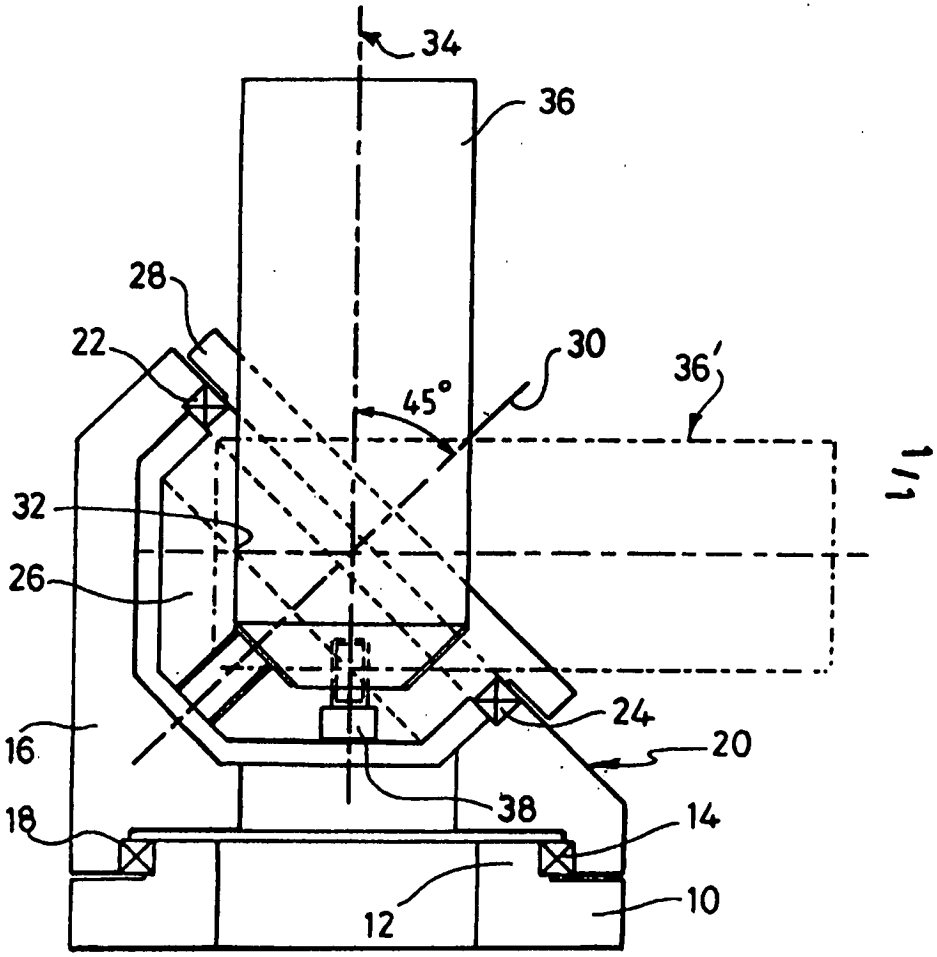

Fig. 2

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TITLE: Telescope Mountings

Field of the invention

This invention relates especially to mountings for telescopes, in particular astronomical telescopes, to enable them to be pointed in any desired direction in the sky. However, the invention is not necessarily limited to telescope mountings, and although reference will hereinafter for convenience be made only to telescope mountings, it is to be understood that this term is intended to cover the mounting of other devices, for example cameras and other optical or mechanical devices.

Background to the invention

Various mounting are known in the prior art to enable a telescope to be directed to any desired point in the sky . One of the most common mountings is a fork type mounting which is pivoted about a base, the telescope being also pivotally mounted between the limbs of the fork on respective trunnion bearings.

Since accurate positioning is of paramount importance to the satisfactory operation of a telescope, for example for a highly accurate tracking of a remote star, it is important that the structure of the mounting has as little flexure as possible. However, the limbs of a fork type mounting must be of a length sufficient to enable a long telescope to pivot freely therebetween, and it is therefore difficult and expensive to design the limbs to be of the required rigidity.

One particular requirement for a robust and rigid telescope is for a remotely controlled telescope. Here the telescope is located in a distant location, usually on top of a high mountain in the other half of the earth's hemisphere, and is computer controlled from a

base station by a modem or satellite link. By relaying the sightings observed by a camera (eg a CCD camera) within or upon the telescope to the base station, so it is possible to study the skies in the opposite hemisphere during the daytime.

It is therefore an object of the present invention to provide an alternative telescope mounting which is capable of being built of a more rigid construction that heretofore.

Summary of the invention

According to the present invention there is provided a mounting for a telescope comprising a base, a first member mounted on the base for rotation about a first axis, a second member mounted on the first member for rotation about a second axis which is inclined at an obtuse angle to the first axis, and means for mounting a telescope to pass centrally through the second member, the longitudinal axis of the telescope being inclined at an obtuse angle to the second axis, whereby the telescope can be positioned at any compound angle within approximately a hemisphere, depending on the angles selected, by a combined rotation of the first and second members.

Where the mounting is used with a telescope purely for astronomical purposes, each of said obtuse angles, respectively between the first and second axes and between said longitudinal axis and the second axis, may be approximately 45°.

Rotation of the first member about the base and of the second member about the first member, is preferably provided by first and second roller bearings respectively.

To provide accurate bearing movement, the roller bearings preferably comprise four steel wire races mounted in aluminium cages, known per se.

The telescope may itself be mounted in roller bearings for rotation about its longitudinal axis. Thereby the image seen by the telescope (eg on a CCD camera) can be rotated slowly to compensate inter alia for the rotation of the earth.

The gaps between the base and the first member, and between the first member and the second member, are preferably sealed to prevent the ingress of moisture or dirt.

The base of the mounting may be disposed in a horizontal plane, so that the first axis will be vertical and the first member will be rotatable in azimuth.

Alternatively, again for astronomical purposes, the base may be mounted at such an angle that the first axis points upwardly to the North celestial pole, eg for areas in the southern United Kingdom at an angle of about 52° from the vertical. In this way, once the telescope has been directed to a particular star or the like, it can be maintained in that specific orientation in space by the known expedient of rotating the first member with a small electric motor at a rate of once per sidereal day.

Brief description of the drawings

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is an end view of a small scale model of a telescope mounting in accordance with the invention; and

Figure 2 is a side view in section of the mounting, as taken on the line II-II of Figure 1;

Detailed description of the embodiment

Referring to to the drawings, there is shown a platform or base 10 for a telescope mounting in accordance with the invention. The base has an upstanding collar 12 on which is fitted the inner race of a first roller bearing 14.

Concentrically mounted above the base 10 is a first member 16 having formed on its underside an annular recess 18 in which is fitted the outer race of the bearing 14. The

member 16 is generally of hollow construction and is formed with a plane face 20 which in this embodiment is disposed at an angle of 45° to the plane of the roller bearing 14.

Fitted in a recess 22 beneath the face 20 is the outer race of a second roller bearing 24, and fitted in the inner race is a generally conical second member 26 having an outer flange 28 abutting the bearing. The member 26 is thus rotatable relative to the first member about an axis 30.

The conical member 26 is provided with a cylindrical aperture 32 whose axis 34 is inclined at an angle of 45° to the axis 30. Fitted in the aperture is a telescope 36 which is secured against the base of the aperture by a fixing such as a screw 38.

In use the telescope 36, which may be of the Newtonian or Cassegrain type, has a charge coupled diode (CCD) camera (not shown) installed in or upon it, and stepper motors or DC or AC servo motors (not shown) are provided for rotating the first and second members 16, 26 under remote control. In this way the telescope can be pointed in any desired direction in the sky. Figure 2 shows also the telescope in chain-dotted outline at 36' in a horizontal or azimuth position.

In order to compensate for the rotation of the earth, it will be necessary in many applications to mount the camera on bearings for rotation about its optical axis. For example, in the Cassegrain type of telescope the camera would be positioned in alignment with the axis 34 approximately at the position of the fixing screw 38. It may then instead be desirable to mount the telescope in bearings and to secure the camera to the telescope so that both are rotatable together as a unit.

Alternatively, the base 10 may be mounted such that the axis of rotation of the first member 16 is directed to the North (or South) celestial pole. Then by imposing a constant rotation of once per sidereal day upon any other movement of the first member 16, the telescope 36 can be maintained in a fixed orientation in space.

It will be observed that the construction of the first member 16, together with that of the second bearing 24 which encircles the telescope 36, provides a much more rigid support for the telescope than a conventional fork type mounting. Thereby flexure and other undesired movement of the telescope is to a greater extent avoided.

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CLAIMS

1. A mounting for a telescope comprising a base, a first member mounted on the base for rotation about a first axis, a second member mounted on the first member for rotation about a second axis which is inclined at an obtuse angle to the first axis, and means for mounting a telescope to pass centrally through the second member, the longitudinal axis of the telescope being inclined at an obtuse angle to the second axis, whereby the telescope can be positioned at any compound angle within approximately a hemisphere, depending on the angles selected, by a combined rotation of the first and second members.

2. A mounting according to claim 1 in which each of said obtuse angles, respectively between the first and second axes and between said longitudinal axis and the second axis, is approximately 45°.

3. A mounting according to claim 1 or claim 2 in which rotation of the first member about the base and of the second member about the first member, is provided by first and second roller bearings respectively.

4. A mounting according to claim 3 in which the roller bearings comprise four steel wire races mounted in aluminium cages.

5. A mounting according to any one of claims 1 to 4 in which the telescope itself is mounted in roller bearings for rotation about its longitudinal axis.

6. A mounting according to any one of claims 1 to 5 in which any gaps between the base and the first member, and between the first member and the second member, are sealed to prevent the ingress of moisture or dirt.

7. A mounting according to any one of claims 1 to 6 in which the base is disposed in a horizontal plane, so that the first axis is vertical and the first member is rotatable in

azimuth.

8. A mounting according to any one of claims 1 to 6 in which the base is mounted at such an angle that the first axis points upwardly to the North or South celestial pole.

9. A mounting substantially as herein described with reference to and as illustrated in, the accompanying drawings.

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Amendments to the claims have been filed as follows

1. A mounting for a telescope comprising a base, a first member mounted on the base for rotation about a first axis, a second member mounted on the first member for rotation about a second axis which is inclined at an acute angle to the first axis, and means for mounting a telescope centrally in the second member, the longitudinal axis of the telescope intersecting the first axis and being inclined at an acute angle thereto, whereby the telescope can be positioned at any compound angle within approximately a hemisphere, depending on the angles selected, by a combined rotation of the first and second members.

2. A mounting according to claim 1 in which each of said acute angles, respectively between the first and second axes and between said longitudinal axis and the second axis, is approximately 45°.

3. A mounting according to claim 1 or claim 2 in which rotation of the first member about the base and of the second member about the first member, is provided by first and second roller bearings respectively.

4. A mounting according to claim 3 in which the roller bearings comprise four steel wire races mounted in aluminium cages.

5. A mounting according to any one of claims 1 to 4 in which the telescope itself is mounted in roller bearings for rotation about its longitudinal axis.

6. A mounting according to any one of claims 1 to 5 in which any gaps between the base and the first member, and between the first member and the second member, are sealed to prevent the ingress of moisture or dirt.

7. A mounting according to any one of claims 1 to 6 in which the base is disposed in a horizontal plane, so that the first axis is vertical and the first member is rotatable in

azimuth.

8. A mounting according to any one of claims 1 to 6 in which the base is mounted at such an angle that the first axis points upwardly to the North or South celestial pole.

9. A mounting substantially as herein described with reference to and as illustrated in, the accompanying drawings.